REMARKS

Applicants respectfully request entry of the foregoing and reexamination and reconsideration of the application, as amended, in light of the remarks that follow.

Conventional insulating films produced by converting a siloxane resin into silica (SiO_2) have a dielectric constant of from 3.5 to 4.2, which is too high for high frequency applications in semiconductor devices. In contrast, the present invention provides a process for producing a film having Si-C-Si structure by irradiating a siloxane compound with an electron dose of from 1 to 200 $\mu C/cm^2$. The resulting film exhibits, in combination, a low dielectric constant of 3 and or lower and improved mechanical properties, e.g., cracking resistance.

Claims 1-15 are rejected under 35 U.S.C. §102(e) over U.S. Patent No. 6,204,201 ("Ross-201"). In addition, Claim 17 is rejected under 35 U.S.C. §102(e) or, in the alternative, under 35 U.S.C. §103(a) over Ross-201. Ross-201 was filed on June 11, 1999. In contrast, the attached Declaration Under 37 § C.F.R. 1.131 establishes that Applicants reduced to practice the present invention prior to June 11, 1999. Thus, Ross-201 is not prior art to the above-identified application. Therefore, the rejections over Ross-201 should be withdrawn.

The Information Disclosure Statement filed with this Amendment discloses U.S. Patent No. 6,207,555 ("Ross-555"). Ross-555 discloses forming vias, interconnects and wiring lines between devices by applying a dielectric layer, such as a siloxane polymer, to a substrate; and irradiating the dielectric layer under conditions "sufficient to cure" an upper portion of the dielectric layer while "not substantially curing" a lower portion of the dielectric film. See, e.g., Ross-555 at abstract; column 3, lines 34-42; column 7, lines 35-43; Claims 1 and 3. However, because Ross-555 requires an uncured lower layer, which is not part of a

semiconductor device, between the cured upper layer and the substrate, Ross-555 teaches away from the independent Claim 1 limitations of "...applying ***directly*** on a ***semiconductor device*** a film comprising at least one siloxane compound; and irradiating the film comprising at least one siloxane compound with electron beams at an irradiation dose of from 1 to 200 $\mu C/cm^2$ to thereby react the siloxane compound ***throughout*** the film and generate silicon carbide bonds represented by Si-C-Si while maintaining the dielectric constant of the film at a value of 3 or lower, ...". Similarly, because Ross-555 requires an uncured lower layer between the cured upper layer and the substrate, Ross-555 teaches away from the independent Claim 20 limitations of "...providing a ***substrate*** comprising a material selected from the group consisting of ***elemental Si, SiO_2 and SiN***; applying ***directly*** on the substrate a film comprising at least one siloxane compound; and irradiating the film comprising at least one siloxane compound with electron beams at an irradiation dose of from 1 to 200 $\mu C/cm^2$ to thereby react the siloxane compound ***throughout*** the film and convert the siloxane to form silicon carbide bonds represented by Si-C-Si while maintaining the dielectric constant of the film at a value of 3 or lower, ...". The specification at page 36, Table 4, reproduced below, demonstrates that electron beam irradiation improves the cracking resistance of siloxane films.

Table 4

Example	Before electron beam irradiation				After electron beam irradiation			
	k	Hardness (GPa)	Si-C-Si bond	Cracking resistance	k	Hardness (GPa)	Si-C-Si bond	Cracking resistance
Example 8	2.6	0.71	Absent	×	2.6	0.9	Present	○
Example 9	2.3	0.50	Absent	○	2.3	0.9	Present	○
Example 10	2.2	0.25	Absent	×	2.2	0.6	Present	○
Example 11	2.2	0.25	Absent	○	2.2	0.8	Present	○
Example 12	2.6	0.71	Absent	×	2.7	1.1	Present	○
Example 13	2.3	0.50	Absent	○	2.3	0.8	Present	○
Example 14	2.6	0.71	Absent	×	2.6	1.0	Present	○

Table 4 shows that the irradiated siloxane films of independent Claims 1 and 20 have improved cracking resistance relative to Ross-555's irradiated siloxane dielectric layer having a crack-prone, substantially uncured lower portion.

The Information Disclosure Statement also discloses an assertion by Applied Materials that Matthew Ross is a co-inventor of the above-identified application. We have investigated confidential documents provided to Applicants by Applied Materials in support of Applied Materials' assertion. However, our review and analysis of the confidential documents indicates that Matthew Ross functioned only as a technician showing Atsushi Shiota how to adjust electron dose on an electron beam exposure machine. We have seen no evidence establishing that Matthew Ross is a co-inventor of the above-identified application. Instead, the evidence indicates that Atsushi Shiota and Kouji Sumiya, alone, are the co-inventors of the above-identified application.

In view of the foregoing amendments and remarks, Applicants respectfully submit that the application is in condition for allowance. Applicants respectfully request favorable consideration and prompt allowance of the application.

Should the Examiner believe that anything further is necessary in order to place the application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

Respectfully submitted,

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Attachments:
McGraw-Hill Dictionary of Scientific and Technical Terms, 5th edition, page 553
Declaration Under 37 § C.F.R. 1.131
Information Disclosure Statement

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